

Attorney Docket No. 13DV-13673 (07783-0087)
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D) AMENDMENTS TO THE DRAWINGS

None.

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E) REMARKS

This Response is filed in response to the Office Action dated March 30, 2005.

Entry of this amendment is requested to clarify the claims for purposes of appeal. Upon entry of this response, claims 1-26 will be pending in this Application.

Applicants teleconferenced with the Examiner on January 24, 2006 to discuss the obviousness-type double patenting rejection. The Examiner indicated that a Terminal Disclaimer would overcome this rejection. Applicants would like to thank the Examiner for the courtesies extended during this teleconference.

In the outstanding Office Action, the Examiner rejected claims 1-2, 4, 6-18 and 24-26 under obviousness-type double patenting; objected to claims 1-23; rejected claims 1-2, 4, 6-10 and 12-13 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer; rejected claims 3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer and Driver (Great Britain Patent No. GB 2,060,436); rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer and applied to claim 9, and further in view of Vakil (U.S. Patent No. 5,407,705); rejected claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 9, and further in view of Eppler; rejected claims 15 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1, and further in view of Demaray (U.S. Patent No. 4,676,994); rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied in claim 1, and further in view of Rigney et al. (U.S. Patent No. 6,455,167); and rejected claims 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1 and further in view of

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Demaray (U.S. Patent No. 4,676,994) and Rigney et al. (U.S. Patent No. 6,455,167); rejected claims 19 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1, and further in view of Tecle (U.S. Patent No. 5,922,403); rejected claims 21-23 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647) and further in view of Kirk-Othmer as applied to claim 1, and further in view of Akechi (Japanese Publication JP60081892A); and rejected claims 24-26 under 35 U.S.C. 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) in view of Klabunde (U.S. Patent No. 4,877,647), Kirk-Othmer, Demaray (U.S. Patent No. 4,676,994), Rigney et al. (U.S. Patent No. 6,455,167) and Eppler.

Double Patenting

The Examiner has rejected claims 1-2, 4, 6-18 and 24-26 over claims 1-16 of U.S. Patent No. 6,720,034, claims 3 and 5 over claims 1-16 of U.S. Patent No. 6,720,034 in view of Great Britain Patent No. GB 2,060,436A, and claims 1 and 9 over claim 1 of copending Application No. 10/726,357 under the judicially created doctrine of obviousness-type double patenting.

The Examiner states

Claims 1-2, 4, 6-18 and 24-26 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 6720034. Although the conflicting claims are not identical, they are not patentably distinct from each other because Claim 1 of the present invention, supplying a metallic component for a gas turbine engine, is generic to, i.e. fully encompasses, Claim 1 of the existing patent. In addition claims 2-16 of the existing patent teaches all the limitations of Claims 2, 4, 6-18 and 24-26 of the present invention.

Claims 3 and 5 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U. S. Patent No. 6720034 in view of GB Patent 2060436. Claims 1-16 of U. S. Patent No. 6720034 teach all the limitations set forth by claims 3 and 5 of the present invention, except teaching of supplying a component comprising cobalt-base superalloy or titanium alloy. However, GB Patent 2060436 teaches of an application of ceramic barrier layer onto a turbine blade comprising of nickel and cobalt superalloys, stainless steel or titanium alloy. Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify U. S. Patent No. 6720034 to use the cobalt-base superalloy or titanium alloy suggested by GB Patent 2060436 to provide a desirable ceramic coating to a metallic substrate

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because U. S. Patent No. 6720034 teaches of applying a ceramic to a nickel-based superalloy and GB Patent 2060436 teaches cobalt-base superalloy or titanium alloy are known in the art to be variants to nickel-based alloy.

Such a modification to claims 1-16 of U. S. Patent No. 6720034 would have been obvious to one of ordinary skill in the art and thus Claims 3 and 5 of the present invention are obvious variants to claims 1-16 of U. S. Patent No. 6720034.

Claims 1 and 9 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 of copending Application No. 10726357. Although the conflicting claims are not identical, they are not patentably distinct from each other because after the application of a ceramic barrier coating in claim 9 of the present invention patent the component of the gas turbine engine inherently has an outer ceramic surface as claimed in claim 1 of the copending application.

The Examiner further states in the Response to Arguments portion of the outstanding Office Action:

The examiner notes the filing of the terminal disclaimer to overcome the obvious-type double patenting rejection. The terminal disclaimer filed on 6/9/2005 disclaiming the terminal portion of any patent granted on this application, which would extend beyond the expiration date of application 10/726357 has been reviewed and is accepted. The terminal disclaimer has been recorded. The examiner notes however, the supplied terminal disclaimer does not include U.S. Patent No. 6720034 by Skoog et al. and therefore the obvious type double patenting rejection to these claims has not been withdrawn.

In response thereto, Applicants are submitting a terminal disclaimer with this response. Therefore, claims 1-18 and 24-26 are believed to overcome the obviousness-type double patenting rejection and are therefore believed to be allowable.

Rejection under 35 U.S.C. 103

A. Claims 1-2, 4, 6-10 and 12-13

The Examiner rejected claims 1-2, 4, 6-10 and 12-13 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. (U.S. Patent No. 5,545,437) hereafter referred to as "Nagaraj et al." in view of Klabunde (U.S. Patent No. 4,877,647) hereinafter referred to as "Klabunde" and further in view of Kirk-Othmer.

Specifically, the Examiner stated that

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Nagaraj et al. teaches a method of applying a heat reflecting on a nickel-based superalloy component of a gas turbine engine by applying a ceramic thermal barrier coating onto the substrate by plasma spraying and then applying the heat reflecting layer of gold or platinum on the thermal barrier coating (Col. 3, line 26-Col. 4, line 24). It is the examiners position that the ceramic thermal barrier coating dries prior to application of the heat reflective coating. Nagaraj et al. does not teach the claimed method of applying the heat-reflecting layer. However, Nagaraj et al. teaches that the heat-reflecting layer can be applied by any conventional deposition technique (Col. 3, lines 49-57). Klabunde teaches forming a reflective metal layer, such as a gold or platinum layer, on a substrate by forming a dispersion of metal particles and organic solvent carrier, applying the dispersion to a substrate and then heating/firing to form the metal layer, where the dispersion can be applied by spraying (Col. 3, lines 35-65; Col. 6, lines 30-54).

Nagaraj et al. in view of Klabunde does not teach the spraying is an air assisted spraying technique. However, using air to atomize and project a spray for coating a gas turbine engines is well established in the art, as shown by Kirk-Othmer. (see page 672, Table 1, page 688, Table 2). and hence would have been an obvious method of spraying the heat-reflective coating because of the expectation of successfully forming the reflective layer.

It would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj using conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othmer because of the expectation of successfully applying the heat reflective layer on a gas turbine engine.

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach the claimed amount of reflective coating mixture and thermal barrier coating applied to the substrate. However, it is the examiners position that the amount of these coatings applied to the turbine component are known result effective variables, as not enough of these coatings applied to the component would not provide the desired heat reflectance and thermal barrier properties, and too much would not offer additional benefits of increased heat reflectance and thermal properties.

Therefore, it would have been obvious to one skilled in the art at the time of the invention was made to determine an optimal coating amount for the heat reflective layer and the thermal barrier layer, in the process of Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer, through routine experimentation, to provide the desired heat reflecting and thermal barrier properties for the turbine component.

The Examiner further states in the Response to Arguments portion of the outstanding Office Action:

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The applicant has argued against the Nagaraj reference stating the present invention does not include a barrier coating, which is deposited by the techniques as disclosed at column 4, lines 15-16 and one would be motivated to deposit the reflective coating on the substrate by such methods. The examiner respectfully disagrees. Nagaraj explicitly discloses any conventional methods for depositing the reflective coating and "conventional methods" is not limited to methods disclosed for another materially different coating. The examiner notes the claim only requires the presence of the steps listed and does not limit the claim to exclude any other steps, which may include a thermal barrier coating as taught by Nagaraj or any other process steps.

Applicants respectfully traverse the rejection of claims 1-2, 4, 6-10 and 12-13 under 35 U.S.C. § 103(a).

The following principle of law applies to all Section 103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Claim 1 recites a method of applying a heat-rejection coating, comprising the steps of: supplying a metallic component of a gas turbine engine; providing a reflective-coating mixture, wherein the reflective-coating mixture comprises a metallic pigment and a reflective-coating-mixture carrier; applying the coating mixture to a surface of the component by a method selected from the group consisting of air-assisted spraying, airless spraying, brushing, and decal transfer, each of the group being capable of being applied at ambient room temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level; and firing the component surface having the reflective-coating mixture thereon to form a reflective coating on the component. (Emphasis added).

Nagaraj, as understood, is directed to metal articles and protective layers that are applied to a metal article. Nagaraj has no teaching of a method for applying a reflective-coating mixture.

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Nagaraj teaches that his mixtures "can be readily deposited" (col. 3, line 60) and mentions "conventional deposition techniques" (col. 3, line 56), but gives no teaching of a specific approach. However, Nagaraj does disclose application techniques for applying a preferred barrier coating which are nitrides and oxides, such as alumina (Al_2O_3) and yttria-stabilized zirconia. Suitable techniques for applying the barrier layer include chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques which are known in the art. (See col. 4, lines 10-24)

Applicants would like to respond to the Examiner's statements contained in the Response to Arguments: (see pages 2-3 of the outstanding Office Action)

The applicant has argued against the Nagaraj reference stating the present invention does not include a barrier coating, which is deposited by the techniques as disclosed at column 4, lines 15-16 and one would be motivated to deposit the reflective coating on the substrate by such methods. The examiner respectfully disagrees. Nagaraj explicitly discloses any conventional methods for depositing the reflective coating and "conventional methods" is not limited to methods disclosed for another materially different coating. The examiner notes the claim only requires the presence of the steps listed and does not limit the claim to exclude any other steps, which may include a thermal barrier coating as taught by Nagaraj or any other process steps.

Applicants note that the Examiner concedes Applicants' above characterization of Nagaraj as it was not disputed in the "Response to Arguments" in the present Office Action. Applicants assert that Nagaraj teaches away from the present invention. First, the present invention recites only applying a reflective coating mixture, not both a reflective coating mixture and thermal barrier coating. Second, since none of the coatings in Nagaraj is applied by previously identified methods as recited in claim 1, the amount applied may differ from previous application techniques. Further, the only deposition methods taught in Nagaraj for applying the barrier layer are chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques. See col. 4, lines 15-18. These processes are specifically not within the scope of the present invention as claimed because they require complex deposition apparatus, and/or special chambers, and limit the size of the articles that may be coated. See paragraphs [0014] and [0037] of the present specification. As discussed in the present application, factors

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such as expense of the equipment required and size limitations of the article to be coated are significant factors as to how one of ordinary skill in the art would consider trying to deposit a reflective coat onto a ceramic outer surface of a gas turbine component. In Nagaraj, the thermal barrier coat must be applied prior to the applying the reflective coat. The thermal barrier coat is deposited only by methods which are specifically outside the scope of the present invention, due to the special apparatus and chambers required. The subsequent reflective coat is applied by unnamed "conventional deposition techniques," such techniques logically being the same apparatus and chambers already available to apply the thermal barrier coat. Since the present invention recites specific deposition techniques, none of which are disclosed or suggested by Nagaraj, with none of the deposition techniques taught by Nagaraj being available to one practicing the present invention, due to the limitations of the Nagaraj techniques, Nagaraj necessarily teaches away from the present invention.

Further, the present invention specifically discloses that a "[The] ceramic barrier coating, where used, is preferably applied by air-assisted spraying a ceramic-barrier coating mixture onto the surfaces of the component, although airless and high volume low pressure (HVPL) methods have also been demonstrated, (see para [0013]) and that "[t]he reflective coating, similar to the ceramic coating, is preferably applied by air-assisted spraying, although airless, HVLP, brushing and decal transfer methods have been demonstrated." (see para [0014]) (emphasis added). In other words, in the present invention, the claimed techniques apply not only for the reflective coating, but also to the ceramic barrier coating. Nagaraj also discloses a ceramic barrier coating similar to the present invention, but Nagaraj disclosure appears limited to chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques. The techniques disclosed by Nagaraj are specifically absent from claimed deposition methods in claim 1, for the reasons previously discussed. Since the present invention discloses applying both ceramic barrier coating and reflective coating by the claimed techniques of air-assisted spraying, airless spraying, brushing, and decal transfer, which each are applied with less expensive equipment and facility requirement than chemical and physical vapor deposition (CVD and PVD), electroplating and plasma spray techniques, were the techniques of air-assisted spraying, airless spraying,

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brushing, and decal transfer actually "conventional deposition techniques" as referred to in Nagaraj, such techniques would have been identified in Nagaraj.

Klabunde, as understood, teaches "spraying or dripping" (col. 6, line 33), but has no teaching of any of the recited techniques. Klabunde also has no teaching of the use of his approach with a "reflective-coating mixture" as claimed. No disclosure, teaching or suggestion by the disclosed references indicates that palladium, platinum, and/or gold colloidal metal dispersions as taught by Klabunde will yield a "reflective-coating mixture" as claimed, and Klabunde has no teaching that they do.

As to the Kirk-Othmer publication, Applicants respectfully traverse the Examiner's contention that the Kirk-Othmer publication teaches coating a gas turbine engine. The Kirk-Othmer publication, as understood, does appear to identify air-assisted and other atomizer spraying techniques and identify some of their commercial uses. However, Applicants would like to point out that the context of the Kirk-Othmer publication, at least with respect to gas turbine engines, is clearly not that of the present invention. That is, for gas turbines, the Kirk-Othmer publication states "[f]or example, there is a growing concern over pollutant emissions from aircraft and automotive engines that utilize atomizers." See page 670. In other words, the spraying techniques cited in this publication with respect to atomizers appears directed to the internal workings of the gas turbine, i.e., the injection of fuel inside the engine for combustion, not applying a coating to the surface of a gas turbine engine. In addition, this publication fails to teach that heat-reflective coatings can be applied by spraying techniques. Therefore, the Kirk-Othmer publication cannot form the basis for concluding that spraying a heat-reflective coating onto a gas turbine engine is obvious due to the expectation of successfully forming the reflective layer as the Examiner suggests. Further, due to the different context of use of the spray as disclosed in the Kirk-Othmer publication, the Kirk-Othmer publication is not combinable with the other references in an attempt to yield Applicant's invention.

In view of the above, the Examiner, in his Response to Arguments on pages 2-3 states:

The applicant argues against the Kirk-Othmer publication stating that the context of the Kirk-Othmer reference is directed toward internal workings of gas turbine engine and fails to teach heat-reflective coatings can be applied by spraying techniques. The examiner respectfully disagrees. The Kirk-Othmer

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publication, as a whole, is directed to known and conventional spraying techniques and discloses, on page 688 in Table 2, air-atomizing sprays is a known method of spraying coatings. Therefore, the Kirk-Othmer publication, reasonably suggests to one of ordinary skill in the art to utilize air-assisted spraying to coat a substrate. Therefore, it would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj using conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othmer because of the expectation of successfully applying the heat reflective layer coating on substrate.

First of all, the Examiner has mischaracterized Applicants' response to the Examiner's first Office Action (page 6) stating:

Nagaraj et al. in view of Klabunde does not teach the spraying is an air assisted spraying technique. However, using air to atomize and project a spray for coating a gas turbine engine is well established in the art, as shown by Kirk-Othmer (see page 672, Table 1, page 688, Table 2), and hence would have been an obvious method of spraying the heat-reflective coating because of the expectation of successfully forming the reflective layer.

Applicants had pointed out, as previously stated, that the Kirk-Othmer publication in fact does not show that it is well established in the art to use air to atomize and project a spray for coating a gas turbine engine, only that certain types of atomizers are used by internal components within gas turbines that have to do with the operation of fuel injection, not spray coatings. Applicants note the Examiner's clarification of Kirk-Othmer, i.e., that the Kirk-Othmer publication, as a whole, is directed to known and conventional spraying techniques, disclosing air-atomizing sprays as a known method of spraying coatings, noting again that the reference to gas turbine engines refer to internal components within gas turbines. However, Applicants assert that the purpose of Kirk-Othman is not to oxidize/combust the coating material. Even if Kirk-Othmer reasonably suggests that air-assisted spraying is available for the applications identified therein while Applicant contends it does not, Kirk-Othman does not disclose or suggest that any methods for coatings applied to the surface of a gas turbine engine. That is, a reflective coating mixture as recited in independent claim 1.

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Moreover, Applicants strongly disagree that even if Kirk-Othmer taught or suggested that air-assisted spraying can be applied to the surface of a gas turbine engine, which it does not, that it would have been obvious to one of ordinary skill at the time of the invention was made to apply the heat reflective layer of Nagaraj et al. using conventional spraying as taught by Klabunde and specifically the conventional air-assisted spraying as disclosed by Kirk-Othmer because of the expectation of successfully applying the heat reflective layer coating on substrate. First of all, as discussed above, Nagaraj et al., does not disclose or suggest any methods for applying a reflective coating, and discloses methods of applying the diffusion layer that are specifically outside the scope of the present invention, thereby teaching away from the present invention as discussed previously. Moreover, Klabunde has no teaching of any of the recited techniques. Klabunde also has no teaching of the use of his approach with a "reflective-coating mixture" as claimed. No disclosure, teaching or suggestion by the disclosed reference indicates that palladium, platinum, and/or gold colloidal metal dispersions as taught by Klabunde will yield a "reflective-coating mixture" as claimed, and Klabunde has no teaching that they do. Finally, Kirk-Othmer does not teach or suggest applying an air assisted coating, or any coating for that matter, that is applied to the outside surface of a gas turbine engine component. Therefore, even if these references were to be combined, they would not yield Applicants' invention.

Furthermore, "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.01.

The Examiner is reminded that "[i]f the proposed modification or combination of the prior art would change the principle or operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." See MPEP, Section 2143.01.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is

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nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.03.

Nagaraj et al. teaches application techniques that cannot be used to practice the claimed invention, and which are specifically identified above.

Therefore, for the reasons given above, independent claim 1 is believed to be distinguishable from Nagaraj et al., Klabunde and Kirk-Othmer and therefore are not anticipated nor rendered obvious by Nagaraj et al., Klabunde and Kirk-Othmer.

Dependent claims 2, 4, 6-10 and 12-13 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 2, 4, 6-10 and 12-13 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 2, 4, 6-10 and 12-13 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde and Kirk-Othmer and are therefore allowable.

B. Claims 3 and 5

The Examiner rejected claims 3 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Driver (Great Britain Patent No. GB 2,060,436) hereinafter "Driver."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach supplying a metallic gas turbine component comprising cobalt-base superalloy or titanium alloy. Nagaraj et al. teaches of a coating on a nickel-base superalloy, but suggests that other suitable high temperature materials could also be used (Column 3, lines 31-32). Driver teaches of an application of ceramic onto a turbine blade, where the coating is suitable for substrates of nickel and cobalt superalloys, stainless steel and titanium alloy.

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to use the cobalt-based superalloy or titanium alloy suggested by Driver to provide a desirable ceramic coating to a metallic substrate because Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer teaches of applying a ceramic to a nickel-based superalloy or other high temperature materials and Driver teaches cobalt-base superalloy or titanium alloy are known in the art to be alternatives to nickel-based alloy.

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Applicants respectfully traverse the rejection of claims 3 and 5 under 35 U.S.C. § 103(a). The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Driver, as understood, is directed to applying a ceramic coating to certain metallic workpieces. However, Driver discloses coating application methods involving heating the workpiece to 500°C and plasma spraying. See col. 1, page 1, lines 47-55. In contrast, the present claimed invention is directed to applying a reflective coating by air-assisted spraying, high volume low pressure methods, brushing and decal transfer method that are capable of being applied at ambient room temperature. See paragraphs [0014] through [0015]. Further, these methods do not limit the size of the article to be sprayed, nor do they require special chambers or other types of application apparatus that are specifically required by the application methods taught in Driver, which methods in Driver being incapable of being performed in the claimed invention. See paragraph [0014]. Therefore, Driver teaches away from the present invention.

Dependent claims 3 and 5 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 3 and 5 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 3 and 5 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Driver and are therefore allowable.

C. Claim 11

The Examiner rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 9, and further in view of Vakil (U.S. Patent No. 5,407,705) hereinafter "Vakil."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach the claimed thermal barrier layer material containing lanthanum or cerium. Vakil teaches a nickel-based superalloy gas turbine engine component having a ceramic thermal barrier coating, where the coating can include cerium (Col. 6, lines 1-25).

It would have been obvious to one skilled in the art at the time the invention was made to use the ceramic thermal barrier coating material of Vakil, including the cerium component, in the process of Nagaraj et al. in view of

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Klabunde and further in view of Kirk-Othmer with the expectation of providing suitable thermal barrier properties, as shown by Vakil for nickel-based superalloy gas turbine engine components.

Applicants respectfully traverse the rejection of claim 11 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Dependent claim 11 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 11 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 11 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde and Kirk-Othmer and Vakil and is therefore allowable.

D. Claim 14

The Examiner rejected claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 9, and further in view of Eppler.

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach that the ceramic thermal barrier coating is applied by air assisted spraying. However, Eppler teaches breaking down a ceramic into fine particles and air assisted spraying them onto a substrate (Page 955, Column 3).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to use the air assisted spray technique suggested by Eppler to provide a desirable ceramic coating on a substrate. Eppler teaches air-assisted spraying is known in the art to provide ceramic coatings onto a substrate.

Applicants respectfully traverse the rejection of claim 14 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Eppler, as understood, is directed to spraying ceramic coatings. However, in the passage cited by the Examiner in Eppler, "[s]praying requires a gun, a container or feed mechanism, an impelling agent, and a properly designed hood or booth maintained under negative pressure (Ref 16)." See page 955, col. 3. (Emphasis added). Stated another way, spraying according to Eppler

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requires a special enclosure to perform. In contrast, the present invention in paragraph [0015], which refers to airless or air-assisted spraying for applying reflective coating and ceramic barrier coating, discloses that:

Most of these other application techniques are limited as to the size of the articles that may be readily coated, because they require special chambers or other types of application apparatus. Airless or air-assisted spraying which are typically ambient room temperature processes, on the other hand, are not limited by these considerations, and therefore may be readily used on a wide variety of sizes and shapes of components.

Therefore, "spraying" according to the present invention is distinctly different than that taught by Eppler so that Eppler teaches away from the present invention. This limitation is incorporated into claim 1, wherein, in the step "applying the mixture to the outer ceramic surface by a method selected from the group consisting of air-assisted spraying, airless spraying, brushing, and decal transfer, each of the group being capable of being applied at ambient room temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level."

Dependent claim 14 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 14 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 14 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Eppler and is therefore allowable.

E. Claim 15

The Examiner rejected claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Demaray (U.S. Patent No. 4,676,994) hereinafter "Demaray."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach polishing in the component prior to applying the thermal barrier

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coating. Demaray teaches polishing a nickel-based superalloy component prior to application of a thermal barrier layer, in order to achieve a desired surface roughness (Col. 2, line 49-Col. 3, line 5). One skilled in the art would have recognized that such polishing/roughening is conventionally used for enhancing the adhesion of subsequently applied coatings to a metal substrate.

Therefore, it would have been obvious to one skilled in the art to polish the nickel-based superalloy component of Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer, prior to applying the coatings, in order to enhance the bonding of the coatings to the metal components, since polishing of superalloys prior to coating to enhance coating adhesion is disclosed by Demaray.

Applicants respectfully traverse the rejection of claim 15 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Demaray, as understood, is directed to applying ceramic coats to article substrates. While Applicants concur that the cited portion of Demaray (col. 2, line 49 through col. 3, line 5) teaches applying a ceramic coat to a substrate, Applicants also note that the ceramic coat is a thermal barrier coat, not a reflective coat. Additionally, the ceramic material in Demaray is applied by techniques other than air-assisted spraying requiring a chamber that is subjected to a reduced atmospheric pressure, these conditions being contrary to the conditions recited claim 1, that is, applying the coating mixture to a surface of the component by a method selected from the group consisting of air-assisted spraying, airless spraying, brushing, and decal transfer, each of the group being capable of being applied at ambient room temperature and not requiring the component to be disposed inside a chamber having a pressure level less than ambient pressure level. See col. 3, line 55 through col. 5, line 30. In other words, since the present invention both teaches applying different types of coatings to substrates and applying the different types of coatings by methods than Demaray, by conditions recited in claim 1 in the present invention that cannot be used to practice Demaray, the component pre-treating of the present invention is not taught or suggested in Demaray, and in fact, teaches away from the present invention.

Dependent claim 15 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 15 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that

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claim 15 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Demaray and are therefore allowable.

F. Claim 16

The Examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Rigney et al. (U.S. Patent No. 6,455,167) hereinafter "Rigney et al."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach pre-oxidizing the component prior to applying the thermal barrier coating. Rigney et al. teaches oxidizing a nickel-based superalloy component of a gas turbine engine in order to enhance the bonding between the superalloy and subsequently applied coatings (Col. 1, lines 7-10; Col. 6, lines 15-40).

It would have been an obvious modification, for one skilled in the art, to Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to oxidize the nickel-based superalloy, in order to enhance the bonding between the superalloy and subsequently applied coatings, as is taught by Rigney et al.

Applicants respectfully traverse the rejection of claim 16 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Rigney et al., as understood, is directed to coatings on superalloy substrates such as a diffusion layer applied to a substrate followed by subsequent alumina layer, followed by a ceramic topcoat. Although the ceramic topcoat may be classified as a thermal barrier coat to allow performance at higher temperatures (see col. 5, lines 21-23), a thermal barrier coat is not a reflective coat as specifically recited in the present invention. Therefore, Rigney et al. cannot be properly combined with the other references to teach providing a desired reflective-coating mixture to form a reflective coating on the ceramic component of the present invention.

Furthermore, "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.01.

The Examiner is reminded that "[i]f the proposed modification or combination of the prior art would change the principle or operation of the prior art invention being modified, then

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the teachings of the references are not sufficient to render the claims *prima facie* obvious." See MPEP, Section 2143.01.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

See Manual of Patent Examining Procedure, 8th Edition (MPEP), Section 2143.03.

A reference merely teaching use of a thermal barrier coating does not suggest that a reflective coating can also be used.

Dependent claim 16 is believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claim 16 recites further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claim 16 is neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Rigney et al. and are therefore allowable.

G. Claims 17-18

The Examiner rejected claims 17-18 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer as applied to claim 1, and further in view of Demaray and Rigney et al.

Specifically, the Examiner stated that:

Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, and Rigney et al. are applied here for the same reasons as given above.

It would have been obvious to one skilled in the art at the time the invention was made to polish and oxidize the nickel-based superalloy component of Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer, prior to applying the coatings, in order to optimize the bonding of the coatings to the metal components, since both polishing and oxidizing of superalloys prior to coating are known to increase coating adhesion as disclosed by Demaray and Rigney et al. Please note that the test of obviousness is not an express suggestion of the claimed invention in any or all references, but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them (*In re Rossetti*, 146 USPQ 183).

Applicants respectfully traverse the rejection of claims 17-18 under 35 U.S.C. § 103(a).

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The above discussion of Nagaraj et al., Klabunde, Kirk-Othmer, Demaray and Rigney et al. are equally applicable here.

Dependent claims 17-18 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 17-18 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 17-18 are not anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, Demaray and Rigney et al. and are therefore allowable.

II. Claims 19-20

The Examiner rejected claims 19-20 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and Kirk-Othmer as applied to claim 1, and further in view of Teele (U.S. Patent No. 5,922,403) hereinafter "Teale."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach of providing a reflective-coating mixture with a noble metal encapsulator. Teele teaches of a method for forming a palladium, silver, gold or platinum in an organic carrier (Column 3, lines 25-35). Teele discloses utilizing an encapsulant material to limit the required amount of solvent (Column 4, lines 59-67). Teele utilizes a metallic colloidal solution with fluxing agents to coat ceramics, metals, and ceramic/metal composites (Column 7, lines 10-31).

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to use a solution containing a metal encapsulant and fluxing agent as taught by Teele to provide a desirable metallic coating because Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer teaches using a metallic pigment in an organic solvent for coating a surface and Teele teaches a metal encapsulant reduces the large amount of solvent required when coating a ceramic or metal substrate and fluxing agents are provide enhanced adherence of a coating to a substrate.

Applicants respectfully traverse the rejection of claims 19-20 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Teale, as understood, is directed to preparing formulations having ultrafine particles that can be placed in a solvent that encapsulates the solvent as applied. However, Teele fails to disclose a technique for applying the solvent to an article substrate, and there is question whether

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the Teele solvent can be applied by at least some of the recited application techniques due to the decreased amount of solvent contained in the Teele suspension.

Dependent claims 19-20 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 19-20 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 19-20 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer and Teele and are therefore allowable.

I. Claims 21-23

The Examiner rejected claims 21-23 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and Kirk-Othmer as applied to claim 1, and further in view of Akechi (Japanese Publication No. JP60081892A) hereinafter "Akechi."

Specifically, the Examiner stated that

Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer does not teach a reflective coating mixture containing a glass or ceramic comprising up to 25% of the reflective mixture. Akechi teaches of using glass frit and noble metal dispersion in an organic vehicle to form a coating (Abstract). Akechi discloses using 1-3 wt % glass frit and 37-59 wt % noble metal powder in a 40-60 wt % organic vehicle (abstract). The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made if the overlapping portion of the range as disclosed by the reference were selected because overlapping ranges have been held to be prima facie case of obviousness. See *In re Wortheim* 191 USPQ 90.

Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify Nagaraj et al. in view of Klabunde and further in view of Kirk-Othmer to use the glass frit/noble metal in an organic vehicle taught by Akechi to provide a desirable noble metal coating which experiences no deformation when coating.

The Examiner also stated in the Response to Arguments, pages 5-6

The applicant has argued against the Akechi reference stating that it teaches a thick paste and not therefore cannot be applied by the coating techniques of the present invention. The examiner only utilizes Akechi as a showing that it is known in the art to provide a glass filler in a noble metal/organic carrier dispersion. In response to applicant's argument that Akechi is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the

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particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, both the prior art and the present claims are directed to applying a metal/organic coating onto a substrate.

Applicants respectfully traverse the rejection of claims 21-23 under 35 U.S.C. § 103(a). The above discussion of Nagaraj et al., Klabunde and Kirk-Othmer are equally applicable here.

Akechi, as understood, is directed to a thick film paste of predetermined percentages by weight of precious metal powder, glass frit and an organic vehicle for preparing a thermal print head. Applicants note that by virtue of the Akechi material being presented in the form of a thick paste, the only identified application technique is printing, which technique is not included as any of the recited application techniques of the present invention. Additionally, Akechi is directed to thermal printing heads, which is not remotely related to reflective coatings on gas turbine engines, and is therefore non-analogous art. Therefore, Akechi is not properly combinable with the other references. As such, Applicants continues to respectfully disagree with the Examiner's position.

Dependent claims 21-23 are believed to be allowable as depending from what is believed to be allowable independent claim 1 for the reasons given above. In addition, claims 21-23 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 21-23 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, and Akechi and are therefore allowable.

J. Claims 24-26

The Examiner rejected claims 24-26 under 35 U.S.C. § 103(a) as being unpatentable over Nagaraj et al. in view of Klabunde and Kirk-Othmer, Demaray, Rigney et al. and Eppler.

Specifically, the Examiner stated that

Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al., Eppler are applied here for the same reasons as given above.

It would have been obvious to one skilled in the art at the time the invention was made to modify Nagaraj et al. by incorporating spraying as taught

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by Klabunde and particularly air-assisted spraying as taught by Kirk-Othmer for turbine engine components, and further incorporate polishing and oxidizing to improve coating adhesion as taught by Demaray and Rigney et al. and to air assist spray the ceramic layer as taught by Eppler because the combination of the references provides known and conventional steps in coating a turbine component to maximize properties and coating adhesion.

Applicants respectfully traverse the rejection of claims 24-26 under 35 U.S.C. § 103(a).

The above discussion of Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler are equally applicable here.

Claim 24 recites a method of applying a heat-rejection coating, comprising the steps of: supplying a metallic component of a gas turbine engine, the component comprising a nickel-base superalloy and having a component surface; pre-treating the component surface; thereafter air-assisted spraying a reflective-coating mixture onto the pre-treated component surface, the reflective-coating mixture comprising a metallic pigment and a reflective-coating-mixture carrier; and firing the component surface having the coating mixture thereon. (Emphasis added).

Therefore, for the reasons previously given for independent claim 1 above, independent claim 24 is believed to be distinguishable from Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler and therefore are not anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler.

Dependent claims 25-26 are believed to be allowable as depending from what is believed to be allowable independent claim 24 for the reasons given above. In addition, claims 25-26 recite further limitations that distinguish over the applied art. In conclusion, it is respectfully submitted that claims 25-26 are neither anticipated nor rendered obvious by Nagaraj et al., Klabunde, Kirk-Othmer, Demaray, Rigney et al. and Eppler and are therefore allowable.

Claim Objections

The Examiner has objected to claims 1-23 because of informalities, specifically the in claim 1, the limitations "applying the coating mixture" should more appropriately read "applying the reflective-coating mixture." In response, Applicants have amended claim 1 to incorporate

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this limitation as indicated by the Examiner. Therefore, Applicants submit that claims 1-23 are allowable.

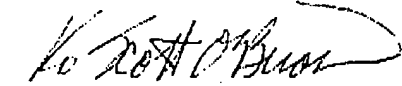
CONCLUSION

Applicants request the entry of the present amendment and the withdrawal of the rejection of claims 1-26. Alternatively, Applicants request entry of the amendment to clarify the claims on appeal. Based on the amendments to the claims, Applicants further request allowance of claims 1-26, and issuance of the application as amended. A timely and favorable action is earnestly solicited.

The Commissioner is hereby authorized to charge any additional fees and credit any overpayments to Deposit Account No. 50-1059.

Respectfully submitted,
McNEES, WALLACE & NURICK

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